(12) UK Patent Application (19) GB (11) 2 357 626 (13) A

(43) Date of A Publication 27.06.2001

(21) Application No 0024778.3

(22) Date of Filing 10.10.2000

(30) Priority Data
(31) 99045297 (32) 19.10.1999 (33) KR

(51) INT CL[7]
G11B 27/32

(52) UK CL (Edition S)
G5R RHE

(56) Documents Cited
GB 2322225 A EP 0841665 A2 EP 0810794 A2
EP 0675495 A2 WO 98/55942 A2 WO 94/11995 A1
CA 002095754 A

(58) Field of Search
UK CL (Edition S) G5R RHD RHE
INT CL[7] G11B 27/30 27/32

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(54) Abstract Title
Recording and reproducing moving pictures using key frames

(57) There are provided an apparatus for recording and/or reproducing a moving picture using key frames by which the overall scenario of moving picture contents can be ascertained during a trick-play mode, and a method thereof. The moving picture recording apparatus includes a recording medium 14, and recording means 12 for recording a representative picture position detected when there is a scene change among coded moving picture data streams, and recording the moving picture data streams on the recording medium 14. The moving picture reproducing apparatus includes a recording medium 14 having coded moving picture streams and a representative picture position detected when there is a scene change, recorded thereon, and reproducing means 18 for searching for the representative picture position recorded on the recording medium 14 and reproducing a representative picture. Therefore, when coded moving picture data streams are recorded, a key frame representing a scene change is automatically detected and the position thereof is recorded, thereby facilitating trick-play mode reproduction.

FIG. 1

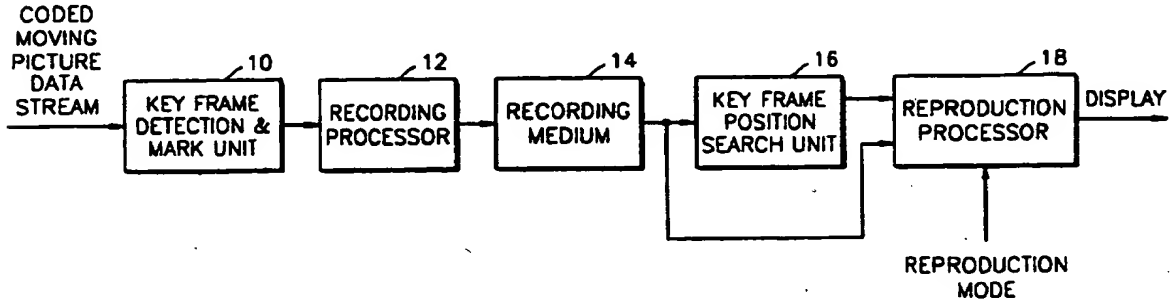

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FIG. 1

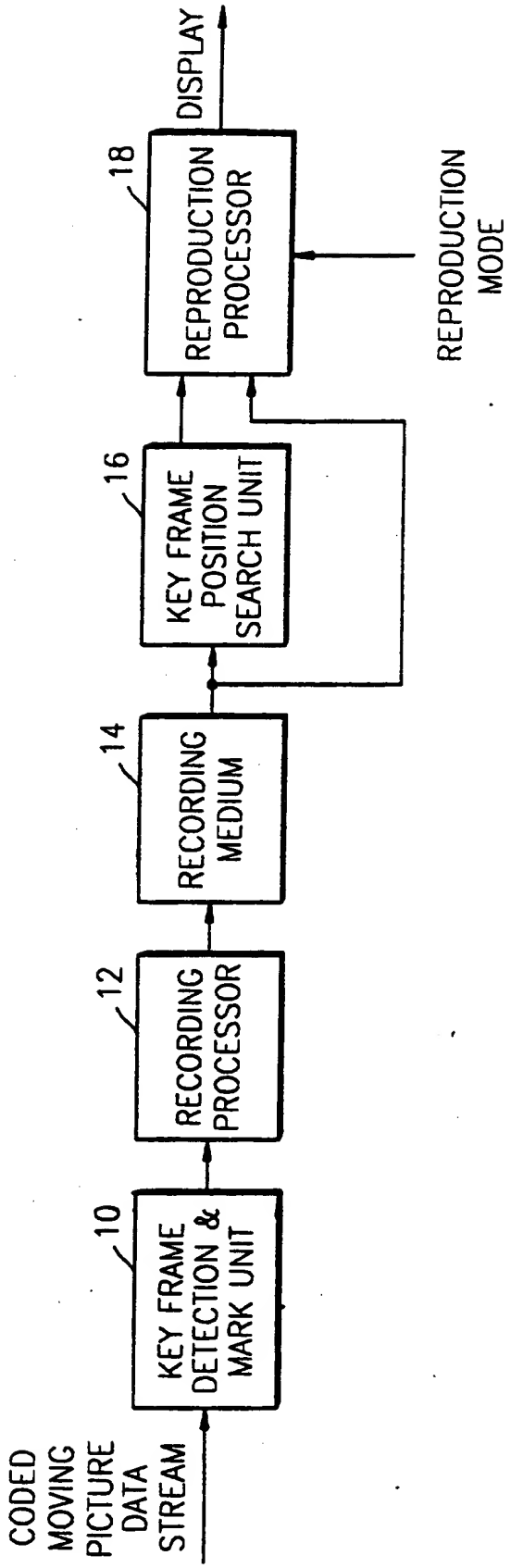

CODED MOVING PICTURE DATA STREAM
10
KEY FRAME DETECTION & MARK UNIT
12
RECORDING PROCESSOR
14
RECORDING MEDIUM
16
KEY FRAME POSITION SEARCH UNIT
18
REPRODUCTION PROCESSOR
DISPLAY
REPRODUCTION MODE

FIG. 2

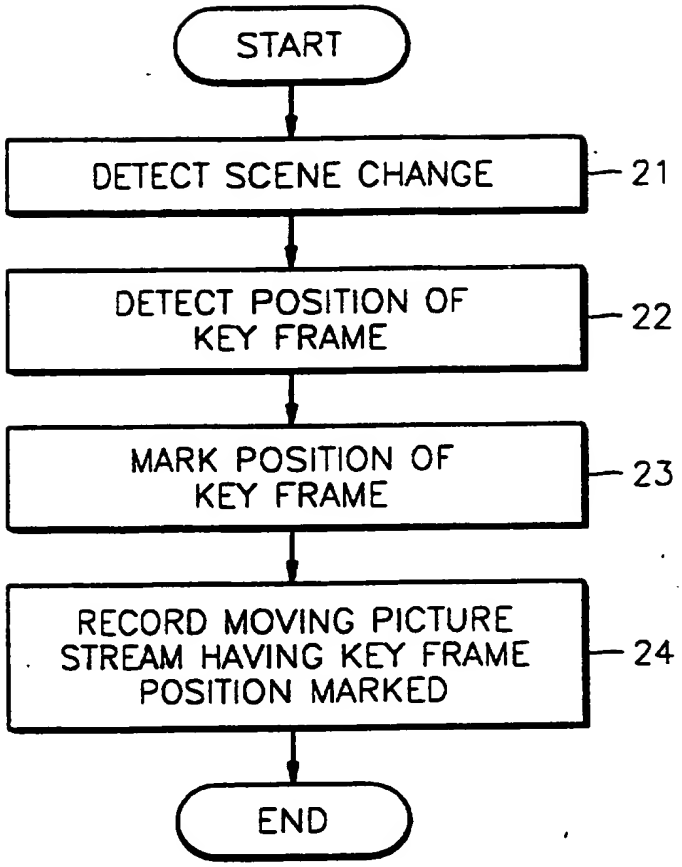
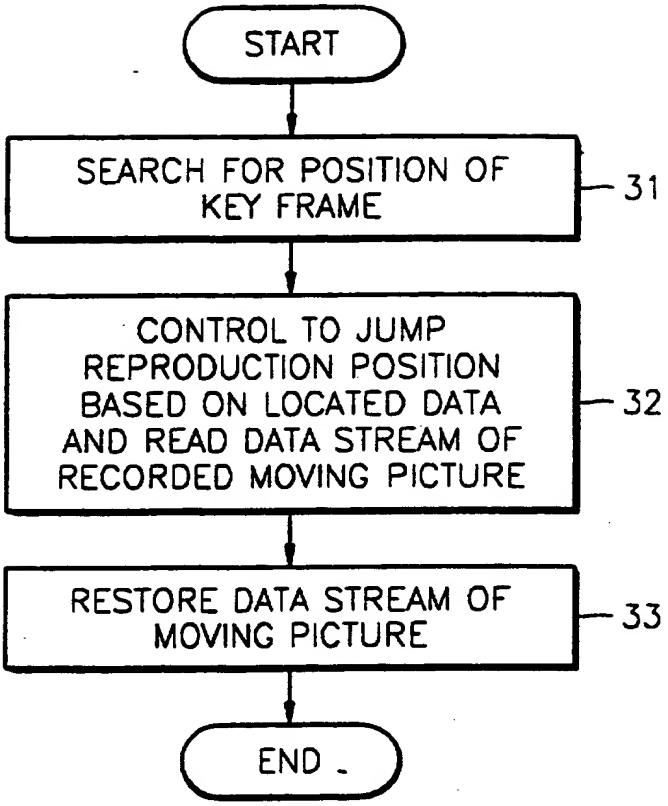


FIG. 3



APPARATUS FOR RECORDING AND/OR REPRODUCING MOVING PICTURE USING KEY FRAME AND METHOD THEREOF

The present invention relates to an apparatus for recording and/or reproducing a moving picture using a key frame and a method thereof, and more particularly, to an apparatus for recording and/or reproducing a moving picture using key frames by which the overall scenario of moving picture contents can be ascertained during a trick-play mode, and a method thereof.

In existing moving picture recording methods, moving picture data streams are recorded on a recording medium as they are, and in existing moving picture reproduction methods, the thus-recorded moving picture data streams are reproduced at a normal speed or at a high speed according to a given reproduction speed factor. During a normal speed reproduction mode, reproduction is performed at a normal speed. During a high speed reproduction mode, reproduction is performed at a speed of 2 times, 4 times or 6 times the normal speed.

While conventional moving picture reproduction methods are performed at a fixed speed selected from predetermined reproduction speed factors. The same problem is even encountered during a high speed reproduction mode, such as a trick-play mode. In other words, in a trick-play mode, reproduction is performed at a speed selected from 2 times normal speed, 4 times normal speed or 6 times normal speed. Thus, it is difficult to reproduce only the key frame corresponding to a user's desired representative picture based on the conventional moving picture

reproduction method. Accordingly, it is quite difficult for a user to accurately detect a desired scene (e.g., the title of a movie) from moving pictures reproduced at a high speed, like in a trick-play mode, and to reproduce the same.

To overcome the above-described problem, there has been proposed a method in which, while watching moving picture contents, a user directly marks every desired scene to be reproduced, the marked scenes to be used as key frames during reproduction. However, according to this method, the user must mark every desired scene manually while watching moving picture contents. As marking is done manually, it is not easy to accurately mark only key frames representing the overall scenario of moving pictures occurring in real-time.

With a view to solve or reduce the above problems, it is an aim of embodiments of the present invention to provide a moving picture recording apparatus for automatically recording positions of representative scenes by which the overall scenario can be estimated, from input moving picture data streams.

It is another aim of embodiments of the present invention to provide a moving picture reproducing apparatus for automatically searching for the position of a representative picture recorded by the moving picture recording apparatus and reproducing the same.

It is still another aim of embodiments of the present invention to provide a moving picture recording and/or reproducing method of automatically recording the position

of a representative picture by which the overall scenario can be estimated from input moving picture data streams, and reproducing only the recorded representative picture.

According to a first aspect, there is provided a moving picture recording apparatus including a recording medium, recording means for recording a representative picture position detected when there is a scene change among coded moving picture data streams, and recording the moving picture data streams on the recording medium.

The recording means preferably includes a key frame detection and mark unit for detecting the position of a key frame corresponding to the representative picture among the moving picture data streams and marking the position thereof, and a recording processor for recording the moving picture data stream having the representative picture position marked therein on the recording medium.

Preferably, the key frame detection and mark unit is configured to detect a scene change and a representative picture position, based on the coding standards of the coded moving picture data streams.

Preferably, in the case where the input moving picture data streams are coded based on MPEG coding standards, when the period pattern of intra-frames of input moving picture data streams is out of the normal intra-frame period pattern compatible with the MPEG coding standards, the key frame detection and mark unit determines that there is a scene change, and then detects the intra-frame occurring for the first time as a key frame corresponding to a representative picture.

According to a second aspect, there is provided a moving picture reproducing apparatus including a recording medium having coded moving picture streams and a representative picture position detected when there is a scene change, recorded thereon, and reproducing means for searching for the representative picture position recorded on the recording medium and reproducing a representative picture.

The reproducing means preferably includes a key frame position search unit for searching for the position of the key frame corresponding to the representative picture among the moving picture data streams recorded on the recording medium, and a reproduction processor for reading out only the moving picture data steam corresponding to the key frame while skipping all the unmarked frames between key frames based on the key frame position data found by the key frame position search unit, and restoring the read data stream into the uncoded original picture data.

Preferably, the reproducing means comprises: a key frame position search unit for searching for the position of the key frame corresponding to the representative picture among the moving picture data streams recorded on the recording medium; and a reproduction processor for reading out only the moving picture data steam corresponding to the key frame while skipping all the unmarked frames between key frames based on the key frame position data found by the key frame position search unit, and restoring the read data stream into the uncoded original picture data.

According to a third aspect, there is provided a moving picture recording method including the steps of (a) if coded moving picture data streams are applied, detecting whether there is a scene change based on the coding standards, (b) if a scene change is detected in the step (a), detecting the position of a frame occurring for the first time after the scene change is detected, as a representative picture position, (c) marking the representative picture position detected in the step (b), and (d) recording the coded moving picture data stream having the representative picture position marked therein.

Preferably, in the step (b), the position of an intra-frame occurring for the first time after detection of the scene change is detected as the representative picture position.

According to another aspect of the present invention, there is provided a moving picture reproducing method for reproducing a moving picture from a recording medium on which coded moving picture data streams having a representative picture position marked therein are recorded, the method including the steps of (a) if a trick-play mode is set, searching for the representative picture position recorded on the recording medium, (b) while controlling the reproduction position of the recording medium based on the position data of the representative picture found in the step (a), reading the moving picture data stream recorded on the recording medium, and (c) restoring the moving picture data stream read in the step (b).

For a better understanding of the invention, and to show how embodiments of the same may be carried into effect, reference will now be made, by way of example, to the accompanying diagrammatic drawings in which:

Figure 1 is a functional block diagram illustrating a moving picture recording and/or reproducing apparatus using a key frame according to embodiments of the present invention;

Figure 2 is an operational flow chart illustrating a moving picture recording method using a key frame according to embodiments of the present invention; and

Figure 3 is an operational flow chart illustrating a moving picture reproducing method using a key frame according to embodiments of the present invention.

The present invention will now be described in detail with reference to the accompanying drawings.

Referring to Figure 1, a moving picture recording and/or reproducing apparatus according to an embodiment of the present invention includes a key frame detection and mark unit 10, a recording processor 12, a recording medium 14, a key frame position search unit 16, and a reproduction processor 18. The key frame detection and mark unit 10 and the recording processor 12 correspond to moving picture recording means. The key frame position search unit 16 and the reproduction processor 18 correspond to moving picture reproducing means.

The key frame detection and mark unit 10 detects whether or not there is a scene change when coded moving picture data streams are input, based on the coding standards of the input moving picture data streams, and detects the position of a key frame corresponding to a representative picture if there is a scene change. Then, the key frame detection and mark unit 10 marks the position of the detected key frame. The coded moving picture data streams are received from a predetermined broadcasting channel or supplied from an external system.

For example, in the case where the input moving picture data streams are coded based on MPEG coding standards, when the period pattern of intra-frames of input moving picture data streams is out of the normal intra-frame period pattern compatible with the MPEG coding standards, the key frame detection and mark unit 10 determines that there is a scene change. After it is determined that there is a scene change, the intra-frame occurring for the first time is detected as a key frame corresponding to a representative picture. Also, in order to indicate that the detected intra-frame is a key frame, the position of the detected intra-frame is marked.

The recording processor 12 records the moving picture data stream having the representative picture position marked therein and the position of a scene representing a scene change on the recording medium 14. Here, the position data of the key frame may be recorded in a separate area of the recording medium 14 or may be recorded together with the moving picture data streams.

The moving picture reproducing means, including the key frame position search unit 16 and the reproduction processor 18, searches for the position data of a representative picture recorded on the recording medium 14 and reproduces only the representative picture. In other words, the key frame position search unit 16 searches for the position data of the key frame recorded in a separate area of the recording medium 14 or recorded with the moving picture data stream.

In the case where the current reproduction mode is a trick-play mode (or fast forward play mode) for appreciating the overall scenario, based on the key frame position data found by the key frame position search unit 16, the reproduction processor 18 reads out only the moving picture data stream corresponding to the key frame while jumping the reproduction position of the recording medium 14, and restores the read data stream into the uncoded original picture data, to then be displayed on a screen.

Therefore, in the moving picture recording and/or reproducing apparatus according to embodiments of the present invention, a user can conveniently ascertain the overall scenario of the moving picture contents reproduced at a high speed and can switch the high-speed reproduction mode to a normal reproduction mode when a user's desired scene appears. Thus, since the detailed moving pictures of the desired scene can be appreciated, the user's satisfaction with the reproduction mode can be enhanced.

Figure 2 is an operational flow chart of a moving picture recording method using a key frame according to embodiments of the present invention.

If the coded moving picture data streams are applied, as shown in Figure 1, in step 21, it is detected whether there is a scene change. In step 22, the position of an intra-frame occurring for the first time after the scene change is detected is detected as the position of the key frame corresponding to a representative picture. In step 23, the detected key frame position is marked to indicate that it is the position of the representative picture. In step 24, the moving picture data stream having the position of the key frame corresponding to the representative picture marked therein is recorded on the recording medium 14.

Figure 3 is an operational flow chart of a moving picture reproducing method using a key frame according to embodiments of the present invention.

If a trick-play mode for appreciating the overall scenario of moving picture contents is set, the position of a key frame corresponding to a representative picture is searched for from the recording medium 14 in step 31. In step 32, while skipping all the unmarked frames between key frames based on the key frame position data found in step 31, the recorded moving picture data streams are read out. In step 33, the read moving picture data streams are restored into the uncoded original picture data.

As described above, when coded moving picture data streams are recorded, a key frame representing a scene

change is automatically detected and the position thereof is recorded. During a trick-play mode, the recorded key frame position is searched for and only the moving picture data stream corresponding to the key frame is reproduced at a high speed, thereby easily ascertaining the overall scenario of moving picture contents without manipulation by a user.

Also, since appreciation of the overall scenario is allowed, a user can switch the reproduction mode to a normal reproduction mode when a user's desired scene appears in the course of watching the overall scenario, thereby easily accessing the user's desired contents among moving picture data streams.

It will be apparent to those skilled in the art from the foregoing that, while particular forms of the invention have been illustrated and described, various modifications can be made without departing from the spirit and scope of the invention. Accordingly, it is not intended that the invention be limited, except as by the appended claims.

The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or

process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

The invention is not restricted to the details of the foregoing embodiment(s). The invention extend to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

CLAIMS

1. A moving picture recording apparatus comprising:

a recording medium; and

recording means for recording a representative picture position detected when there is a scene change among coded moving picture data streams, and recording the moving picture data streams on the recording medium.

2. The moving picture recording apparatus according to claim 1, wherein the recording means comprises:

a key frame detection and mark unit for detecting the position of a key frame corresponding to the representative picture among the moving picture data streams and marking the position thereof; and

a recording processor for recording the moving picture data stream having the representative picture position marked therein on the recording medium.

3. The moving picture recording apparatus according to claim 2, wherein the key frame detection and mark unit is configured to detect a scene change and a representative picture position, based on the coding standards of the coded moving picture data streams.

4. The moving picture recording apparatus according to claim 3, wherein, in the case where the input moving picture data streams are coded based on MPEG coding

standards, when the period pattern of intra-frames of input moving picture data streams is out of the normal intra-frame period pattern compatible with the MPEG coding standards, the key frame detection and mark unit determines that there is a scene change, and then detects the intra-frame occurring for the first time as a key frame corresponding to a representative picture.

5. A moving picture reproducing apparatus comprising:

a recording medium having coded moving picture streams and a representative picture position detected when there is a scene change, recorded thereon; and

reproducing means for searching for the representative picture position recorded on the recording medium and reproducing a representative picture.

6. The moving picture reproducing apparatus according to claim 5, wherein the reproducing means comprises:

a key frame position search unit for searching for the position of the key frame corresponding to the representative picture among the moving picture data streams recorded on the recording medium; and

a reproduction processor for reading out only the moving picture data steam corresponding to the key frame while skipping all the unmarked frames between key frames based on the key frame position data found by the key frame position search unit, and restoring the read data stream into the uncoded original picture data.

7. A moving picture recording method comprising the steps of:

(a) if coded moving picture data streams are applied, detecting whether there is a scene change based on the coding standards;

(b) if a scene change is detected in the step (a), detecting the position of a frame occurring for the first time after the scene change is detected, as a representative picture position;

(c) marking the representative picture position detected in the step (b); and

(d) recording the coded moving picture data stream having the representative picture position marked therein.

8. The moving picture recording method according to claim 7, wherein, in the step (b), the position of an intra-frame occurring for the first time after detection of the scene change is detected as the representative picture position.

9. A moving picture reproducing method for reproducing a moving picture from a recording medium on which coded moving picture data streams having a representative picture position marked therein are recorded, the method comprising the steps of:

(a) if a trick-play mode is set, searching for the representative picture position recorded on the recording medium;

(b) while controlling the reproduction position of the recording medium based on the position data of the representative picture found in the step (a), reading the moving picture data stream recorded on the recording medium; and

(c) restoring the moving picture data stream read in the step (b).

10. A moving picture recording apparatus substantially as herein described with reference to the accompanying drawings.

11. A moving picture recording method, substantially as herein described with reference to the accompanying drawings.

12. A moving picture reproducing method, substantially as herein described with reference to the accompanying drawings.

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Application No:	GB 0024778.3	**Examiner:**	Michael Waters
Claims searched:	1 to 12	**Date of search:**	18 April 2001

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Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): G5R (RHD, RHE)

Int Cl (Ed.7): G11B (27/30, 27/32)

Other: Online: WPI, EPODOC, PAJ

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2322225 A	(SAMSUNG) see description	9
X	EP 0841665 A2	(SHARP) see column 3 line 57 to column 4 line 23 and rest of detailed description	1 to 8
X	EP 0810794 A2	(NIPPON TELEGRAPH) see figure 4 and column 6 line 43 to column 7 line 21 for example	1 to 8
X	EP 0675495 A2	(SIEMENS) page 5 line 34 to page 6 line 7	1 to 8
X	WO 98/55942 A2	(PHILIPS) see page 3, lines 9 to 23	1 to 8
X	WO 94/11995 A1	(DUBNER) figure 2 and page 7, paragraphs 1 and 2 for example	1 to 8
X	CA 2095754 A	(IBM) pages 9 and 10	1 to 8

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.